## NOTES 19: CLT-BASED INFERENCE FOR PROPORTIONS

Stat 120 | Fall 2025 Prof Amanda Luby

**CLT:** The Central Limit Theorem (CLT) tells us that if the sample size is big enough and the sample is random,

$$\bar{X} \sim N(\underline{\hspace{1cm}},\underline{\hspace{1cm}})$$

$$\hat{p} \sim N(\underline{\hspace{1cm}},\underline{\hspace{1cm}})$$

The general form for a confidence interval is:

**Example:** Finding  $z^*$ 

- 95% confidence interval
- 68% confidence interval
- 99% confidence interval
- 90% confidence interval

## 1 How big is big enough?

Example 1:  $\hat{p}=.5$ 

Example 1:  $\hat{p}=.05$ 

## **Rule of Thumb for Proportions:**

- Expected count in each category (Yes/No) should be > \_\_\_\_\_
- \$np > \$ \_\_\_\_ and \$n(1-p) > \$ \_\_\_\_

## 2 How do we find the SE?

Standard Error for Proportions:		
<b>Idea:</b> As $n$ gets bigger, the SE gets if $\hat{p}$ is close to 0 or 1	If $\widehat{p}$ is close to .5, the SE is	than
Example: ESP Example Again		
n = 14		
p_hat = 3/14 n = 14		
$SE_p = sqrt((p_hat*(1-p_hat))/n)$ $z_score = (p_hat2)/SE_p$		
p_val = pnorm(z_score, lower.tail = FALSE) p_val		
[1] 0.4482		
n=1400:		
n=14000:		
Big Picture Picture		